January 1983

Cranes of the World: Demoiselle Crane (*Anthropoides virgo*)

Paul A. Johnsgard
University of Nebraska-Lincoln, pajohnsgard@gmail.com

Demoiselle Crane

Anthropoides virgo (Linnaeus) 1758

Other Vernacular Names. None in General English use; Shuai-yu-hao (Chinese); Grue demoisella, Demoiselle de Numidae (French); Jungfernkranich (German); Karkarra (Hindi); Aneha-zuru (Japanese); Krasavka zhuravl (Russian); Grulla damisela, Grulla moruna (Spanish).

Range. Bred at least formerly in northwestern Africa (Algeria, Tunisia, possibly northern Morocco); currently breeds in Europe from the southern Ukraine and the Crimea through southeastern Russia (north to the region of Volgograd and south to the steppes to the east of the lower Volga), eastward through the steppes of the Kirghiz, western Siberia, southern Minusinsk, and the Altai, Lake Baikal, and of southern Transbaikalia, to the steppes of northwestern Manchuria. Breeds locally southward to the Sea of Aral, western Chinese Turkestan, and Mongolia, with isolated colonies in Armenia, northwestern Tadzhikistan, and Inner Mongolia. Also recently found breeding in eastern Turkey. Migratory, wintering in northwestern Africa (from Lake Chad to the White and Blue Niles), India, and Pakistan, and more rarely in Assam and Burma. Perhaps winters locally or rarely elsewhere (Iraq, Iran, Seistan, Baluchistan), with vagrants sometimes reaching Japan, Ussuriland, and western Europe.

Subspecies. None recognized.

Measurements. Wing, males 453-508 mm (average of 15, 484.4 mm); females 449-490 mm (average of 12, 469.8 mm). Exposed culmen, males 63-71mm (average of 15, 66.35 mm); females 60-68 mm (average of 12, 65.1 mm). Tarsus, 168-201 mm (average of 15, 180.1 mm); females 152-186 mm (average of 12, 170.4 mm). Eggs, average 83.6 × 53.8 mm (72.0-91.5 × 48.9-56.65 mm) (Walkinshaw, 1973).

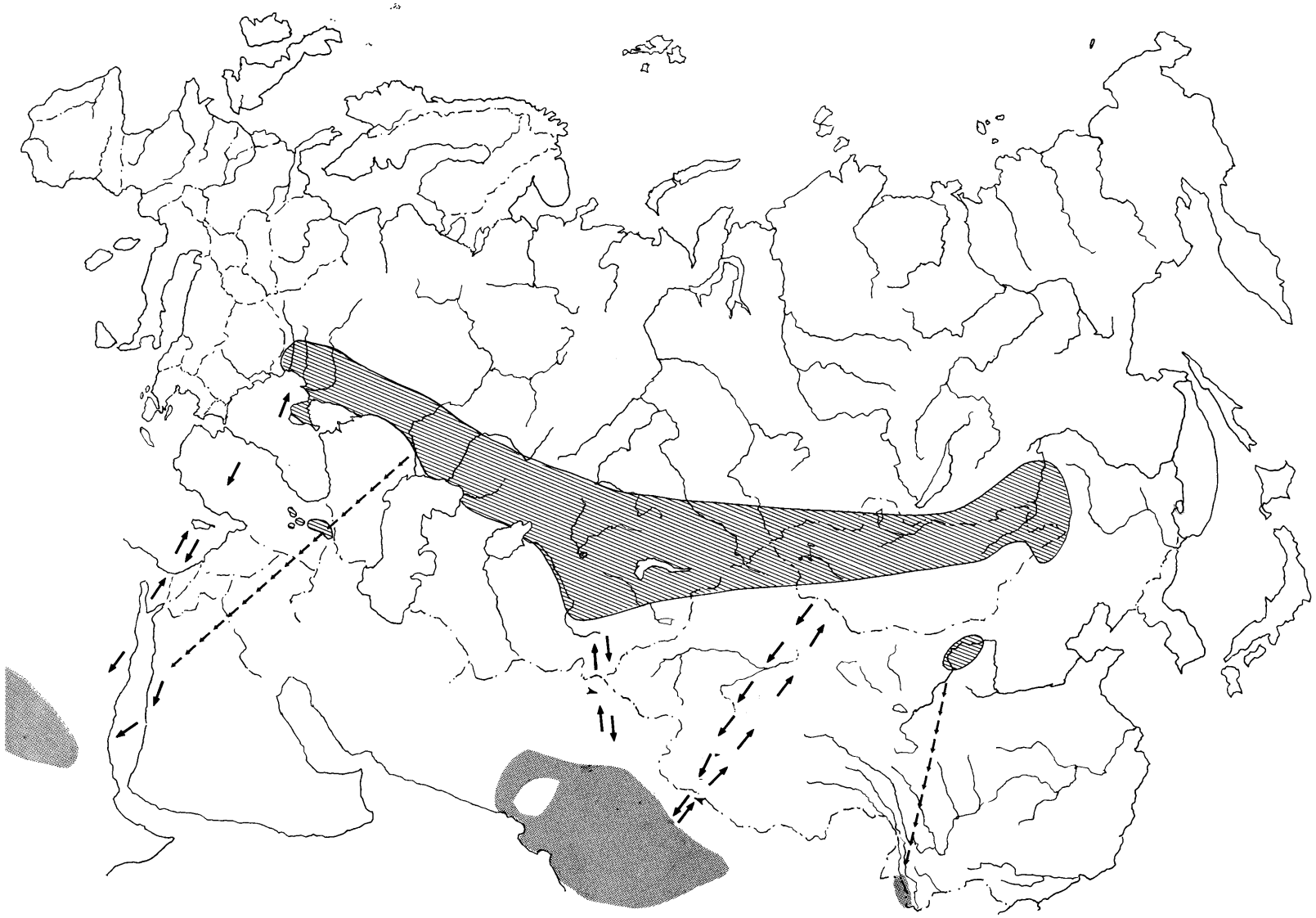
Weights. Adult males (3) from the USSR weighed from 2,325 to 2,450 grams, and adult females ranged from 1,985 to 2,750 grams (Dementiev and Gladkov, 1968). Wintering birds in India ranged from 2,250 to 3,060 grams (Ali and Ripley, 1969). Two males in June weighed 2,325 grams and two females weighed 2,100 and 2,500 grams (Glutz, 1973). The estimated egg weight is 134 grams and the actual weight of fresh eggs is about 130 grams (Heinroth and Heinroth, 1926-28).

Description

Adults of both sexes are alike, with a light gray feathered area from the crown to the nape. A line over the ear coverts, a patch below the eye, and a long plume behind the coverts are pure white. The rest of the head and neck are black, with the feathers of the lower neck long and pointed, hanging below the breast. The primaries, greater coverts, and alula are black. The secondaries are black, with increasing amounts of gray basally on the inner webs. The inner secondaries are long, pointed, straight, and ashy gray, the outer and middle ones with darker tips and outer webs. The tail and upper tail coverts are gray, with darker tips, and the rest of the body plumage is pale bluish gray. The iris is red, the legs and toes are black, and the bill is greenish at the base, yellowish in the center, and pinkish at the tip.

Juveniles are pale ashy gray on the head, neck, body, and wing coverts, becoming nearly white on the head. The tufts on the ear coverts are grayish and only slightly elongated, as are the feathers of the lower neck. The flight feathers are like those of adults, but duller, and the inner secondaries are shorter than in adults and dull slate gray, with pale inner webs.

Immatures from their first autumn to spring are like adults, but the black of the head and neck is duller, the



Breeding (hatched) and wintering (shaded) distributions of the demoiselle crane. Large arrows indicate major known migratory routes; smaller arrows indicate minor or presumptive routes. Arrowhead indicates location of Kali Gandaki Valley, Nepal.

feather tips of the head and neck are often tinged with rufous, the tertials and elongated head and neck feathers are shorter and less dense, and the ear tufts are tinged with gray. Many of the body feathers are tinged with ash brown or sepia at the tips, and the general color is less uniformly bluish gray than in adults.

Downy chicks have the crown and nape buff brown, the sides of the head, chin, and throat light buff, and the upperparts and sides gray brown or buff brown, with darker stripes on the back and on each wing. The underparts are pale gray to off-white (Cramp and Simmons, 1980; Walkinshaw, 1973). Downy young of this species are duller than those of *Grus grus*, with less rufous apparent. There is a second down coat that is light drab, with hair brown along the middle of the back (Fjeldså, 1977).

Identification

In the field, this small crane is the only one that exhibits a uniformly black neck and head, save for ornamental white ear tufts. Otherwise it is generally grayish in appearance. Its calls are surprisingly low-pitched, and are never performed with wing-drooping.

In the hand, this is the smallest crane (bill with culmen length of less than 75 mm), and the only one with white ear tufts that hang down behind the nape. Its trachea does not penetrate the keel of the sternum, but does pass along its anterior edge.

DISTRIBUTION AND HABITATS

Historical and Current Breeding Ranges

The range of this species has evidently retracted considerably in historical times, especially in its western sector. For example, it once bred near Kairouan in Tunisia, but was rare there by the 1930s and there have been no recent records. Breeding in Morocco occurred as recently as the 1930s. It also bred in small numbers in Algeria during the nineteenth century, at Boghari, Zahrez, and Zani. It regularly occurred during migration in southern Spain during that same period, but there is no evidence of its breeding there (Cramp and Simmons, 1980).

Similarly, the species bred in Romania in the late 1800s, and perhaps continued to nest in Dobrogea until as late as 1926. It may also have bred in Moldavia and Wallachia. In the adjacent USSR it once bred further north (to Kiev, Kharkhov, and Poltava) (Cramp and Simmons, 1980). It still evidently extends as a breeding species from the northern Caucasus (Manych, Mozodz, and Nogai steppes) and Transcaucasia (Lake Sevan) eastward through the Volga and Ural River steppes and across Kazakhstan north of the Aral Sea, southeastwardly perhaps to northern Tadzhikstan (Leninabad region, near Tashkent), then eastwardly north of the Tian Shan Mountains to Mongolia and Inner Mongolia (Dementiev and Gladkov, 1968).

Besides this range, a small disjunctive breeding unit still occurs in eastern Turkey, where nesting has been documented on three occasions since 1966. The birds have also been observed during spring in the Middle Atlas Mountains of Morocco during the 1960s and 1970s, but no breeding has been proven (Cramp and Simmons, 1980). However, Archibald et al. (1981) recently reported the finding of a group of cranes "apparently breeding near Rez, Morroco."

The account of Kozlova (1975) provides the most detailed recent information on the species' central Asian distribution. She states that its primary nesting area is now in the Mongolian People's Republic, and that it nests less commonly in southern central Asia. Originally the species inhabited the entire Asian steppe region all the way to its western edge, but now except for Mongolia it is largely found in Kazakhstan (sporadically in Hirghisa), in the lower Volga Valley in Predkavkaz (near the Caucasus), and in the southern Ukraine. The northern limit extends to east of the region of Khailar, and the steppes along the rivers Argun and Aga. In southwestern Qabakail it still occurs near Kyakhta and is common in the Tuvinsk Minasinsk and Abakansk steppes and in the southern parts of Kulinda. In Kazakhstan it nests north to 50-52° north latitude, in the Volga region to 49°, while in the Ukraine it has survived only in the steppes near the Black Sea and in Sivash. Its eastern limits probably include the foothills of the Great Khingan Range of Manchuria, and beyond this may extend to the upper Sungari Basin. The most easterly nesting records are for Yakchikh, a short distance east of Khailar in the steppes of the River Yal Butekhatsi, in the Tungar hills near the border of Mongolia and Inner Mongolia, and in Alashan. Beyond the Altai Mountains of Mongolia the species becomes rare in the Gobi Desert (Kozlova, 1975). A recent estimate of the USSR population of demoiselle cranes is 45,000 to 50,000 birds, although this estimate is based on extremely limited data (USSR Crane Working Group Information Bulletin, November 1981).

In the western parts of its USSR range, the species apparently now occurs from the Issyk-Kul and Sonkyol lake valleys to the At-baski River, the edges of the Betapak-Dall Desert, the Telikulsk lakes, the upper reaches of the Emba River, the southern parts of the Middle Ural, and the Volga nearly to its mouth. It also occurs in the vicinity of Volgograd, the Kalmyk steppes, and the Predkaykaz steppes. It also still nests in the middle and lower Dom River basin on the Kerchensk Peninsula, and in the steppes near the Black Sea in the Crimea to the mouth of the Dnieper River (Kozlova,

1975). The Kalmyk steppes support the densest USSR nesting population of 6,000 to 8,000 nesting pairs.

Habitat Requirements and Densities

This species breeds mainly in steppe habitats, ranging altitudinally from inland sea level up to perhaps about 3,000 meters (Cramp and Simmons, 1980), as at Lake Sonkyol (Kirgiziya) USSR. Typically it inhabits hilly steppes that penetrate into mountains along wide river valleys, where it may even occupy forest edge habitats such as meadows. It prefers dry areas dominated by wormwood (*Artemisia*) and grassy steppes of feathergrass (*Stipa*) and fescue (*Festuca*). It occurs in shrubby steppes and in semi-deserts, but occupies damp marshes and swamps only during feeding. Evidently access to water is an essential requirement, and the birds use such diverse sources as rivers, streams, or even wells to drink (Kozlova, 1975). They will at times be found on unvegetated alkali flats, or on large expanses of rock or gravel. Foraging is often done in cultivated areas, especially after the young are well grown. In recent years, nesting in cultivated areas of the USSR has become more prevalent and may be an important conservation development.

Breeding densities are evidently quite low, although detailed estimates are not available. According to Chekmenev (1960), the birds are distributed widely in desert regions, with neither the topography nor vegetational characteristics affecting their distribution. However, the critical habitat requirement is a proximity to water, with no nests being located more than 1.3 kilometers from water, and most nests situated 200 to 500 meters from water. Spengenberg (in Dementiev and Gladkov, 1968) located ten nests within a 10-kilometer square area of the Volga River, some of which were no more than 200 or 300 meters apart. Grummt (1961) reports an average density of about 10 square kilometers per pair in northern Mongolia. Nests often average about 3 to 4 kilometers apart, but may be closer under favorable conditions, and in one instance six nests were found separated by distances of 300 to 1,500 meters (Glutz, 1973).

Wintering Range and Habitats

Wintering in Africa is mainly on the Blue and White Niles at about 9-15° north latitude, in river margins and dry acacia grass habitats, generally south of the wintering areas of the Eurasian crane. Some wintering also occurs in western Ethiopia, and another important wintering area is in Chad (Lakes Fitri, Iro, and Chad) (Cramp and Simmons, 1980). Wintering also occurs in the northwestern and west-central part of the Indian subcontinent, diffusing eastwardly occasionally to Assam and Bangladesh, and southward to Mysore. Bengal, Assam, and Burma are evidently minor wintering areas. In India the birds occur in winter crop fields, paddy stubble, sandy riverbeds, and on the flat and open margins of jheels and tanks (Ali and Ripley, 1969). The easternmost regular wintering grounds are in Burma (coastal and the Irrawaddy Valley); no wintering is believed to occur in China.

FOODS AND FORAGING BEHAVIOR

There is no detailed information on foods of the demoiselle crane, but plant materials are consumed for much of the year, supplemented by invertebrates, especially beetles, during summer (Chekmenev, 1960). According to Kozlova (1975), this species primarily consumes seeds, especially grass seeds, but also readily eats large insects, worms, and lizards. When foraging it walks slowly, in fits and starts, but sometimes while catching insects it makes quiet movements and is also an adept runner. In their wintering grounds in India, large flocks gather in cultivated areas, where they consume large amounts of wheat, chickpeas, and alfalfa. Ripening cereal crops are also favored, and the birds sometimes do considerable damage to such crops (Ali and Ripley, 1969). Likewise in the USSR during late summer and fall the birds often move into cereal fields to feed on the ripening grains, and they often do great damage to crops (Dementiev and Gladkov, 1968).

MIGRATIONS AND MOVEMENTS

Seasonal Movements

The migrations of this species consist of two major units. Probably most or all of the birds breeding west of the Volga River and the Caspian Sea winter in northeastern and north-central Africa; a juvenile banded in the Ukraine was recovered in the Sudan the following December (*Vogelwarte* 26:200; Cramp and Simmons, 1980). The major wintering area, however, occurs on the Indian subcontinent, which probably provides wintering for the major breeding populations of Mongolia and adjacent areas. Presumably the Burmese wintering grounds receive migrants from extreme eastern Asia.

Dementiev and Gladkov (1968) have summarized the fall migration in the USSR, stating that flocking begins as early as August, and at times the flock sizes may reach 400 or more birds. Most have departed from Dauria by late August and all by mid-September, and similarly in the Altai fall migration begins in late August and continues to mid-September. Maximum fall numbers in the Kalmykia area reach 26,000 to 29,000 birds, and

spring numbers are 17,000 to 18,000 (USSR Crane Working Group Information Bulletin No. 2, 1981).

On the lower Irgiz River the local cranes begin leaving in August and continue to late September, leave Turkemenia from mid-September, and depart the Ukraine in early September.

Migrants in the Nile Valley have been observed through September. The main passage over Cyprus occurs before that of the Eurasian crane, during August and early September. The birds pass over the Red Sea between late August and late September, and are present in their African winter quarters between October and February, when the northward movement begins (Cramp and Simmons, 1980).

The spring migration from Africa moves north over the Red Sea during the second half of March, and over Cyprus from late March to mid-April. The first arrivals in southern Russia are usually reported near the end of March, although in cold springs the birds may be delayed until April. Some late spring movements over the Red Sea (late May and early June) may be of immature birds (Cramp and Simmons, 1980).

A major migratory route for the population of eastern Asian demoiselle cranes that winter in the Indian subcontinent crosses the Dhaykagiri-Annapurna range in north-central Nepal. This enormous range is partly bisected by the Kali Gandaki River (84° east longitude), and at least during the fall migration period this valley provides a major means of access for cranes wintering in northern and northeastern India. Martens (1971) reported that huge numbers of demoiselle cranes passed through this valley during early October of 1969. In less than ten days of observation he counted more than 30,000 cranes, and judged this to be an incomplete count. According to Fleming, Fleming, and Bangdel (1976), the demoiselle crane migrates in large groups through Nepal in October and November, and again in April and May.

A more recent study by Thiollay (1979) in the same area of the Kali Gandarki valley between September 24 and October 5, 1978, provides additional details on the magnitude of this fall flight. During this twelve-day period, which was certainly well before the peak migration period, he counted 61,000 cranes. He reported that during good weather conditions many birds were seen flying between 5,000 and 8,000 meters (16,500 to 26,400 feet) above sea level, and that they were really concentrated in the valley only during conditions of strong winds and heavy clouds. Few other migrants were observed during this time, but golden eagles (*Aquila chrysaetos*) regularly harassed the migrating cranes. The eagles not only disturbed the migration, but also killed some of the birds as well. Quite possibly this narrow corridor is the major migratory route for all of the demoiselle cranes breeding in Siberia and Mongolia , and thus systematic counts in the area would be of great value in estimating the current world population of this species.

Little else is known of the migrations of the eastern half of the population. The fall migrants regularly appear over Kohat in northwestern Pakistan in late August, while their earliest reported arrival date in Mysore, India, is December 20. Their latest spring departure there is March 5 (Ali and Ripley, 1969). In Tadzhikstan spring migrants have been seen during the first half of April, on the lower Syr Darya during the second third of April, and in the vicinity of the Aral Sea at the end of April. In the Altai Mountains they arrive from mid-April to the first part of May, and in northern Mongolia between late April and early May (Dementiev and Gladkov, 1968).

Daily Movements

Ali and Ripley (1969) noted that while the birds are on the wintering grounds of India they spend mornings and early afternoons feeding in newly sown or stubble fields and in fields of ripening crops. The rest of the day and also the nighttime hours are spent lazing on open sandbars of large rivers or on the margins of jheels. Actual distances moved in the course of a day are still unreported.

GENERAL BIOLOGY

Sociality

Flock sizes during spring and fall migrations in central Kazakhstan are evidently fairly small; Chekmenev (1960) reports the first spring flocks are usually small groups of 4 to 10 birds, while larger flocks arrive later on in April. During the breeding season in May the birds sometimes feed in fields in groups of as many as 7 birds, according to Chekmenev.

During the fall migration, large flock sizes seem to be more common. As many as 400 birds have been reported in Ili, Kazakhstan. However, probably many large flocks go undetected during migration, as they fly relatively high (Dementiev and Gladkov, 1968) and are appreciably smaller than the other Eurasian cranes. Meinertzhagen (1954) suggests that demoiselle cranes generally fly at altitudes of 330 to 1330 meters, and thus might easily be overlooked.

On wintering areas large flocks are often typical; one flock in the Punjab area of India (apparently with a mixture of Eurasian cranes) consisted of a broad band of birds extending about 1.5 miles in length (Ali and Ripley, 1969). Similarly, in the Sudan, flocks of this species and of Eurasian cranes numbering up to 20,000

individuals have been reported south of Khartoum (Mathiasson, 1964). Where mixed with Eurasian cranes, the demoiselles evidently maintain separate social groups within the larger assemblage (Cramp and Simmons, 1980).

Daily Activities

The daily activities of this species are probably very much like those of the Eurasian crane, although specific details are lacking. As noted earlier, the birds typically forage in fields during mornings and early afternoons while in their wintering grounds, and roost on open sandbars or along the margins of jheels. According to Chekmenev (1960), during the incubating period the foraging period lasts about three or four hours, presumably by the nonincubating bird. The incubating bird will not leave the nest during the hottest and coldest portions of the day.

Interspecific Interactions

In spite of their rather small size, these cranes are evidently fierce protectors of their nests, and not only will give chase to dogs and foxes but also will attack eagles (*Aquila*) and bustards (*Otis tarda*) without hesitation (Baker, 1928). The birds often associate during wintering periods with Eurasian cranes, but the extent of their competition is unknown. The incubating cranes are tolerant of such domesticated animals as sheep that might pass within about 100 meters of the nest, but an incubating bird may leave the nest should such intruders approach within 40 or 50 meters (Chekmenev, 1960). At times as many as six birds will cooperatively drive predators away from the vicinity of the nest site. There has also been a case reported in which a bird assisted its mate when the latter was attacked by a peregrine (*Falco peregrinus*); the crane used its sharp inner claws for such aerial defense rather than the bill. On the other hand, a captive bird once reportedly killed a man by stabbing him through the eye (Cramp and Simmons, 1980).

BREEDING BIOLOGY

Age of Maturity and Time of Breeding

There are few records of known-age birds breeding in captivity. One pair bred initially in Flamingo Gardens, England, when the male and female were each five years old (from a private survey by Joe Blossom). However, it has been suggested that in the wild the birds may breed initially when only two years old (Glutz, 1973; Cramp and Simmons, 1980).

The breeding period is fairly extended over the species' broad geographic range. In the Crimea the egg records extend from the end of April to the middle of May. In northern Kazakhstan the records are from the middle of May to the end of June, and in northern Mongolia from the end of May to the end of June (Glutz, 1973; Dementiev and Gladkov, 1968). Hatching extends from late May (May 21 earliest date for central Kazakhstan) to the end of June (northern Mongolia) (Walkinshaw, 1973). There is no information available as to what if any incidence of renesting might occur under natural conditions.

Pair Formation and Courtship

As in all cranes, this species is monogamous and is believed to have a lifelong pair bond. Courtship is greatly prolonged, and occurs not only on the breeding grounds; dancing behavior has also been observed during fall migration (Dementiev and Gladkov, 1968) as well as during spring (*Ibis* 89:77-98).

According to Archibald (1975, 1976), the vocalizations of this species during the guard call and unison call sequence are similar to those of the blue crane; both have raspy calls with poor harmonic development. In both species of *Anthropoides* the female usually begins the call, and a single female call is uttered for each of the male's calls. The female begins the display by extending her head and neck from slightly behind the vertical backward to as much as 45 degrees, and utters the first of a series of calls at the rate of about two per second. The male soon joins in, with his neck held vertically and the bill tilted about 45 degrees below the vertical. The male's calls are somewhat lower than those of the female, and are somewhat longer and more broken than those of the female. During the sequence the female may remain in her extreme back-tilted neck position or may gradually return the head and neck to the vertical. The wings are not lowered and the tertials are not noticeably raised in either sex. The display lasts about three or four seconds (Walkinshaw, 1973).

During mutual display, dancing also occurs, in which the birds often bow with spread wings, and also may throw small objects up into the air (Kozlova, 1975). As the birds are relatively small, these movements are done with considerable grace and animation. The dancing is done with the inner wing feathers depressed rather than raised, and is more balletlike than in *Grus*, with the birds not jumping so high or so frequently as in other cranes. Occasionally the birds head-bob toward one another, either synchronously or alternately, and move in semicircles around each other, with the tail raised and the wings slightly opened. As in other cranes, there seems to be no differentiation of the sexes during such displays, which most often occur at dawn and especially at dusk. During group display, the birds often form a loose ring around dancing individuals; the participants raise their ear tufts and black neck plumes, and fan their tails while uttering their loud calls.

Occasionally the dancing birds are replaced by birds from the group of "spectators," and sometimes the entire group will "race" off in one direction. The activity is ended by the group flying up, circling the area, and breaking up into smaller groups or pairs (Baker, 1928; Cramp and Simmons, 1980).

Territoriality and Early Nesting Behavior

After their arrival on the breeding grounds, demoiselles tend to remain social for a time, the flocks reassembling at morning and evening, presumably for foraging and roosting. However, territorial behavior soon begins, and at that time the pairs become relatively scattered, with the nest sites rarely closer than 200 to 300 meters apart. Six nests in Kirgiz were spaced at distances of 300 to 1,500 meters apart (Glutz, 1973). The territories are established fairly near a source of water and in areas that are partially to entirely free of vegetation. Walkinshaw (1973) has suggested that the relative proximity of nests in this species may be related to their communal display tendencies, and is reflected in their relatively weak voices as compared with *Grus* species. Further, the small size of the birds no doubt makes them much more vulnerable to predators, and this may also encourage a greater degree of sociality.

The nest site is invariably simply a place in which small stones are present, and no attempt is made to find or construct a concavity. Sometimes rootlets are also found in the nest too. Occasionally old nest sites are present as well, suggesting a strong nest-site fidelity. Of four nests found in Kazakhstan and reported on by Chekmenev (1960), one was on a flat area of steppe with a soil foundation and vegetation present, one was on a bare hilltop otherwise covered with grass, one was on a bare area of a hill, and one was on a bare valley area between hills.

Egg-laying and Incubation

In Siberia the eggs are laid between the end of May to the end of June, while in central Kazakhstan egg-laying is appreciably earlier. There, hatching may occur as early as May 21, suggesting that egg-laying may begin in April in some cases (Chekmenev, 1960). The eggs are laid at intervals of 24 to 28 hours, and replacements may be laid after early loss of the eggs (Cramp and Simmons, 1980). On the other hand, Chekmenev noted that after a nest was destroyed the birds remained around for a time, and then began a wandering pattern of behavior. The clutch is normally two eggs, but rarely consists of one or three (Walkinshaw, 1973). Of eight completed clutches, seven had two eggs and one was of a single egg (Glutz, 1973). The eggs are generally pale olive yellow or olive green, with purplish lavender spotting, and, according to Chekmenev, blend very well into their background.

The eggs are certainly incubated by both sexes, but mostly by the female. Chekmenev implies that it is the female that undertakes the incubation, with foraging by the adults never done closer than 300 meters from the nest. The incubating bird sits with its head held high, yet is often hard to see because of the surrounding grass. When it senses danger it rises from the nest, walks some distance, then takes flight and calls to its mate. Together the birds circle the nesting area. When the danger is past, the birds approach the nest, inspect the area, and resume incubation. Sometimes the nonincubating male will also walk by the nest, look it over, and wander away only when all is quiet. The incubating birds are tolerant of nearby sheep when they are at least 100 meters from the nest, but leave the nest if they approach within 40 or 50 meters. When flushed from the nest during early morning hours when the temperature is 6° C, the bird will return to the nest within an hour, but later when the temperature is 20° C the bird may stay away two or three hours.

The incubation period is 27 to 29 days, the shortest of all the crane species. Toward hatching, the incubating bird sits more tightly than earlier in incubation. At that time, the male may sometimes divert danger by calling and dancing, or the female may perform a distraction display if suddenly surprised on the eggs. Either or both adults may also feign disablement, walking with the head and body low to the ground, and dragging the tips of both wings on the ground (illustrated in Cramp and Simmons, 1980). Occasionally as many as six birds may cooperate in driving predators from a nesting area, further suggesting the value of small territories and somewhat clumped nesting behavior in these birds.

Hatching and Postbreeding Biology

Since incubation begins with the first egg, hatching is asynchronous, although at times the eggs evidently hatch nearly simultaneously. Thus, Chekmenev (1960) described a nest in which both newly hatched chicks were present and still quite helpless, while in another, one chick was dry and probably hatched the previous evening, while the other had already left the nest. Evidently the adults normally take the chicks from the nest as soon as they are fully dried. When they are approached by humans, the chicks huddle on the ground, like downy balls. Soon after hatching they begin to feed, and later, when approached by danger, they attempt to hide under grassy cover. After the birds become fairly mobile, the family begins a wandering life, but they do not stray more than two kilometers from water. Then, when the young are in danger the chicks hide while the adults fly ahead, or when older the young birds will also jump and attempt to fly.

The food of the chicks is probably mostly insect materials; captive chicks ate beetles, orthopterans, butterflies, and ants. Incubating adults that were exam-

ined were found to have consumed grain, other plant seeds, and a few beetles (Chekmenev, 1960). In late summer, the birds fly to nearby grainfields to feed. The fledging period is probably 55 to 65 days, which is extremely short for cranes (Cramp and Simmons, 1980).

Probably most fledging occurs in the Kazakhstan region by late July or early August, assuming that hatching normally occurs before the first of June. However, fall migration here usually occurs in October, so perhaps families spend a month or two after fledging in putting on weight and gathering into premigratory flocks. Unlike most other cranes, the adults do not molt their primary and secondary feathers simultaneously during this period, and thus remain able to fly continuously . However, wing molt does begin during the late summer and early fall. According to Dementiev and Gladkov (1968), primary replacement proceeds from the innermost and outermost primaries to the middle ones, and occurs over a period of four or five months, from late July until December. By September or October only the second or third primaries have yet to be replaced. Evidently the secondaries, "tertials," and tail feathers are replaced later, since specimens taken at this time show no trace of molt in these areas. Cramp and Simmons (1980) suggest that the primaries are molted in a centrifugal pattern from the middle ones, but with the outermost ones perhaps not molted during the same season but rather only in the next year, when the molt cycle begins again. Molt patterns in the young birds are still unstudied, but probably are similar to those of the Eurasian crane (Cramp and Simmons, 1980).

The young birds evidently leave on migration with their parents, and presumably remain with them through the winter. It is believed that the age of first breeding in this species may be as early as two years, so family bonds perhaps persist for at least a year.

RECRUITMENT RATES, POPULATION STATUS, AND CONSERVATION

Unfortunately, there is no good information on the incidence of juvenile birds in fall or winter flocks, although such information should be easily obtainable. Similarly, there are no estimates of population status except in Europe and northern Africa, where the species has been essentially exterminated. There are no precise data from the USSR, but there are suggestions of a marked decline there too (Cramp and Simmons, 1980). In Mongolia the species is still very common, widely distributed, and an abundant nester, and Mongolia probably has the largest population of demoiselle cranes in the world. The species is not hunted there, and so conditions are favorable for its conservation in Mongolia (Bold, 1981).

EVOLUTIONARY RELATIONSHIPS

The recent study by Wood (1979) supports the idea that *Anthropoides* is a valid genus, since the two *Anthropoides* species generally clustered together in nearly all the analyses he undertook. Wood noted that *Anthropoides* was more often (5 of 8 analyses) associated with *Grus* than with either *Bugeranus* or *Balearica*. However, *Anthropoides* ecologically resembles *Balearica* in that both are primarily vegetarians (as also is *Bugeranus leucogeranus*), and further both *Anthropoides* and *Balearica* tend to have relatively short or weak vocalizations and live where food is fairly abundant on plains or in fields (Walkinshaw, 1973). These similarities are certainly the result of ecological convergence rather than suggestive of evolutionary affinities.